SB761
U62
#86-1

FPM 86-1

October 1985

United States
Department of
Agriculture

Forest Service

**Forest Pest
Management**

Davis, CA

Drop Size Spectra of Rotary Atomizers with *Bacillus thuringiensis* Tankmixes

LIBRARY
OCT 03 1986
ROCKY MOUNTAIN STATION

FPM 86-1
October 1985

DROP SIZE SPECTRA OF ROTARY ATOMIZERS WITH *BACILLUS THURINGIENSIS* TANKMIXES

Prepared by:
W.E. Yates
R.E. Cowden

Agricultural Engineering Department
University of California
Davis, CA 95616

Prepared for:
U.S. Department of Agriculture
Forest Service
Forest Pest Management
2810 Chiles Road, Suite B
Davis, CA 95616
(916)758-4600

John W. Barry and Larry Gross
Project Leaders

Purchase Order No's. 40-91S8-5-0917,
40-91S8-5-0975, 40-91S8-5-1252.
(Work under these purchase orders
was completed in September 1985)

Pesticide Precautionary Statement and Disclaimer

This publication reports research involving behavior of air pollutants and pesticides. It does not contain recommendations for pesticide use. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

Information contained in this report has been developed for the guidance of employees of the Forest Service, U.S. Department of Agriculture, its contractors, and its cooperating Federal and State agencies. The Department of Agriculture assumes no responsibility for the interpretation or use of this information by other than its own employees.

The use of trade, firm, or corporation names is for the information and convenience of the reader. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or approval of any product or service to the exclusion of others which may be suitable.

PREFACE

The purpose of these wind tunnel tests was to establish drop size characteristics of Dipel 6L, Dipel 8L, Thuricide 32LV, and Thuricide 48LV atomized with Micronair, Beecomist, and Unimizer. Results will be used by the USDA Forest Service in developing prescriptions for applying Bacillus thuringiensis and in selecting nozzle types and in positioning nozzles on spray booms. These data will be used also as input to mathematical models which predict spray coverage, canopy penetration, and off-target drift. Wind tunnel tests help to provide data with the aim to achieve optimum droplet spectra and application rates for effective insect control.

Funding was provided by USDA Forest Service, Forest Pest Management, Washington Office. Questions and comments should be directed to the Project Leaders, John W. Barry, Forest Pest Management, 2810 Chiles Road, Suite B, Davis, CA 95616 (916)758-4600 or Larry Gross, Forest Pest Management, P.O. Box 2417, Washington, D.C. 20013 (703)235-8209.

Table of Contents

	Page
Preface	i
Contents	ii
Introduction	1
Results	2
Summary	3
Table I - Tank Mixtures and Total Application Rate Required to Apply 12 BIU/Acre	4
Table II - Flow Rate Required for Selected Applications	4
Table III - Adjustments Required for Selected Flow Rates	5
Table IV - Rotational Speed of Atomizers at Selected Flow Rates, Airspeed and Atomizer Adjustments	5
Table V - Summary of Drop Size Spectrum	6
Table VI - Drop Size Data, Beecomist, 70 mph, 0.44 gpm, Undiluted Dipel 8L	7
Figure I - Drop Size and Mass Data Graphs, Beecomist, 70 mph, 0.44 gpm, Undiluted Dipel 8L	8
Table VII - Drop Size Data, Beecomist, 70 mph, 0.88 gpm, 1 Part Dipel 8L, 1 Part Water	9
Figure II - Drop Size and Mass Data Graphs, Beecomist, 70 mph, 0.88 gpm, 1 Part Dipel 8L, 1 Part Water	10
Table VIII - Drop Size Data, Unimizer, 145 mph, 1.8 gpm, 8500 rpm, Undiluted Dipel 8L	11
Figure III - Drop Size and Mass Data Graphs, Unimizer, 145 mph, 1.8 gpm, 8500 rpm, Undiluted Dipel 8L	12
Table IX - Drop Size Data, Micronair, 150 mph, 5.7 gpm, 3 Parts Thuricide 32LV, 1 Part Water	13
Figure IV - Drop Size and Mass Data Graphs, Micronair, 150 mph, 5.7 gpm, 3 Parts Thuricide 32LV, 1 Part Water	14
Table X - Drop Size Data, Micronair, 150 mph, 5.7 gpm, 1 Part Thuricide 48LV, 1 Part Water	15

Table of Contents (cont.d)

Page

Figure V - Drop Size and Mass Data Graphs, Micronair, 150 mph, 5.7 gpm, 1 Part Thuricide 48 LV, 1 Part Water 16

Table XI - Drop Size Data, Micronair, 150 mph, 5.7 gpm, 1 Part Dipel 6L, 1 Part Water 17

Figure VI - Drop Size and Mass Data Graphs, Micronair, 150 mph, 5.7 gpm, 1 Part Dipel 6L, 1 Part Water 18

Introduction:

A series of tests was conducted to measure the drop size spectra from three types of rotary atomizers commonly used on agricultural aircraft. Tests included several selected concentrations of Dipel and Thuricide formulations at flow rates required for typical aerial applications.

Equipment:

The three atomizers used in these tests were: a Micronair AU5000, a Unimizer and a Beecomist 360A spinner. The tests were conducted in a wind tunnel that has a test section 8 ft. long with a 2 x 2 ft. cross section.

A particle Measurement System (PMS) probe, OAP-2D-GA1, with a PMS 11-C data acquisition system was used to measure the drop size spectra. The probe has a nominal class size of 33 μm. The system counts and classifies the drops into 62 size classes from 28 to 2062 μm.

Procedures:

A series of 6 tests was designed to measure the drop size spectrum for 5 different tank mixtures applied with three different rotary atomizers. All test conditions were selected to apply 12 BIU/acre. Table 1 shows the selected atomizer, tank mixture, and the required total application rate (oz. tank mix/acre) for the 6 test conditions in this report.

Table II shows the flow rate per atomizer required for the selected air speed, swath width, no. of units and desired application rate for each atomizer.

The flow rate was experimentally determined by collecting the liquid in a

bucket during a measured time interval. Spray pressure and V.R.U. settings were adjusted to achieve the desired flow rate for each test. Table III shows the pressure and V.R.U. settings required for each desired flow rate.

Table IV shows the rotational speed of each atomizer at the selected flow rate, air speed and atomizer adjustment.

The drop size measurement procedures were similar to previous protocol developed for testing rotary atomizers. Briefly the PMS probe was mounted in the wind tunnel with the laser beam located 5.25 inches above the bottom of the wind tunnel test section and 12 inches downstream from the rear of the rotary atomizer. The atomizer was mounted on an adjustable vertical shaft such that the unit could be moved to a series of radial distances from the laser beam. Sample positions were calculated based on radial locations to represent the center of equal size sample areas. A single nozzle test involved taking a sample at six to nine sample positions, based on the size of the spray pattern. The reports for the different positions were combined into one composite pattern that represents the overall temporal drop size distribution for the atomizer. This was repeated for each atomizer and the results averaged to determine the drop size distribution reported for each test condition.

The software used for these tests was PMS version 123 with AVG set at 20,000. The sample width (DFM) was 1 cm, with one sample interval of 1 minute for each report. The slice rate was adjusted to 3 MHz at 70 mph and 4 MHz for the 145 and 150 mph tests.

Results:

Table V contains a summary of the drop size spectrum for the 6 selected test conditions. The nomenclature used is as follows:

$D_{V.1}$ = Diameter that contains 10% of volume in drops of smaller size.

$D_{V.5}$ = Volume Median Diameters = Diameter that contains 50% of volume in drops of smaller diameter.

$D_{V.9}$ = Diameter that contains 90% of volume in drops of smaller size.

$$\text{Relative Span} = \text{R.S.} = \frac{D_{V.9} - D_{V.1}}{D_{V.5}}$$

The appendix contains the complete drop size frequency data, statistical results and graphs for each of the six tests with the rotary atomizers.

Summary:

Six drop size distributions were measured from three types of rotary atomizers using five different mixtures of Bacillus thuringiensis.

The two tests with the Beecomist showed that the undiluted Dipel 8L formulation produced the largest $D_{V.5}$ of 146 μm compared to 126 μm for mixture that was diluted with 50% water. The larger droplet size could be attributed to the higher viscosity of the spray. The trend was similar to previous tests with various concentrations of Dipel used with a fan type nozzle (Yates et al. 1983, "Nozzle orientation, air speed and spray formulation affects on drop size spectrums," Trans. of ASAE 26:6, pp. 1638-1643).

The Unimizer at a flow rate of 1.8 gpm and 145 mph produced the smallest $D_{V.5}$.

The three tests with the Micronair at 150 mph and a flow rate of 5.7 gpm produced a very similar $D_{V.5}$ for the tests with different mixtures.

Table I

Tank Mixtures and Total Application Rate
Required to Apply 12 BIU/Acre

Atomizer	Formulation	Conc. of form BIU/Gal	Tank Mix Pt. Form:Pt. Water	Total Appl. Rate Oz. Tank Mix/Acre
Beecomist	Dipel 8L	64	undiluted	24
Beecomist	Dipel 8L	64	1:1	48
Unimizer	Dipel 8L	64	undiluted	24
Micronair	Thuricide 32LV	32	3:1	64
Micronair	Thuricide 48LV	48	1:1	64
Micronair	Dipel 6L	48	1:1	64

Table II

Flow Rate Required for Selected Applications
All applications based on 12 BIU/Acre

Atomizer Type	Airspeed mph	Swath Width ft.	Total Application Rate Oz./Acre	Total Flow Rate gpm	No. of Atomizers	Flow Rate per Atomizers gpm
Beecomist	70	100	24	2.65	6	0.44
Beecomist	70	100	48	5.30	6	0.88
Unimizer	145	200	24	11.0	6	1.8
Micronair	150	300	64	45.5	8	5.7

Table III

Adjustments Required for Selected Flow Rates

Atomizer	Flow Rate gpm	V.R.U.* Setting	Pressure psi
Beecomist	0.44	7	15
Beecomist	0.88	7	30
Unimizer	1.8	8	38
Micronair	5.7	13	50

* V.R.U. is the Variable Restrictor Unit Manufactured by Micronair.

Table IV

Rotational Speed of Atomizers at Selected Flow Rates, Airspeed and Atomizer Adjustments

Atomizer	Flow Rate gpm	Airspeed mph	Blade Setting/ Voltage	Spinners RPM
Beecomist	0.44	70	28 VDC	12700
Beecomist	0.88	70	28 VDC	12700
Unimizer	1.8	145	#5	8500
Micronair	5.7	150	45°	8000

Table V

Summary of Drop Size Spectrum from
the Three Atomizers with Selected Mixtures and
Parameters for an Application of 12 BIU/Acre

Atomizer type	Airspeed mph	Flow Rate Per Unit gpm	Mixture	Drop Size, μm			R.S.
				$D_{V.1}$	$D_{V.5}$	$D_{V.9}$	
Beecomist	70	0.44	Dipel 8L	83	146	232	1.03
Beecomist	70	0.88	50% Dipel 8L	60	126	201	1.12
Unimizer	145	1.8	Dipel 8L	64	121	181	0.97
Micronair	150	5.7	75% Thur. 32LV	73	133	189	0.87
Micronair	150	5.7	50% Thur. 48LV	73	137	214	1.02
Micronair	150	5.7	50% Dipel 6L	76	138	193	0.85

TABLE VI

BEECOMIST 360A,70 MPH,.44 GPH,DIPEL 8L,UNDILUTED

DTG 85/03/12 11:09:00

DFM=1.0--3.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	gm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	6173	3.12E 07	1.03	60.87	4.93	60.87	4.93
89	8825	6.67E 06	1.33	13.02	6.37	73.88	11.31
122	9814	7.41E 06	4.50	14.46	21.63	88.34	32.94
154	8224	3.58E 06	4.90	5.99	23.55	95.33	56.48
187	6089	1.51E 06	3.90	2.94	18.77	98.27	75.25
219	4016	576138	2.52	1.12	12.11	99.39	87.36
252	2366	211489	1.44	0.41	6.93	99.80	94.29
284	1169	73293	0.74	0.14	3.54	99.95	97.82
318	366	19306	0.28	0.04	1.33	99.98	99.16
351	123	6177	0.12	0.01	0.58	100.00	99.74
382	29	1409	0.04	0.00	0.17	100.00	99.91
414	6	448	0.01	0.00	0.07	100.00	99.98
447	2	82	0.00	0.00	0.02	100.00	100.00
479	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		5.13E 07	20.80				

TOTAL RAW PARTICLES.... 47202/50530-- 93.41%

NUMBER MEAN DIAMETER... 67.27 MICROMETERS S.D.... 41.73

VOLUME MEAN DIAMETER... 91.89 MICROMETERS S.D.... 122.56

SAUTER MEAN DIAMETER... 123.76 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 82.50 MICROMETERS

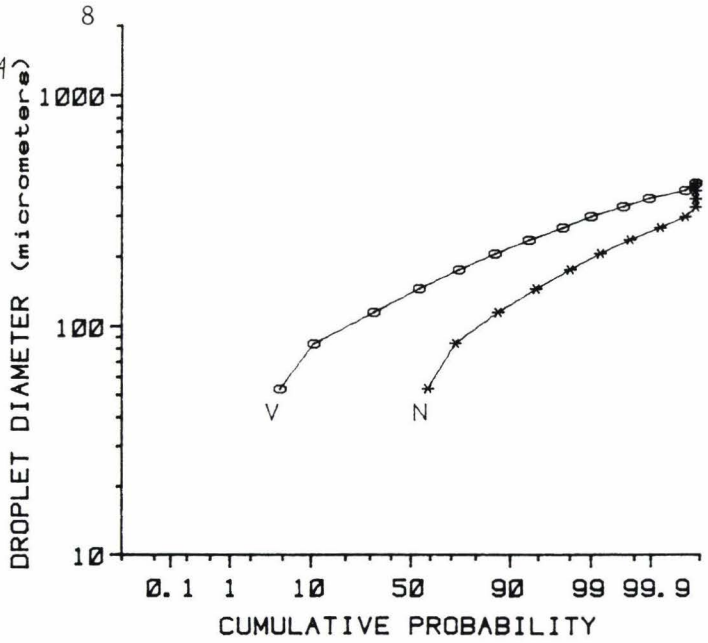
$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 145.52 MICROMETERS R.S.... 1.03

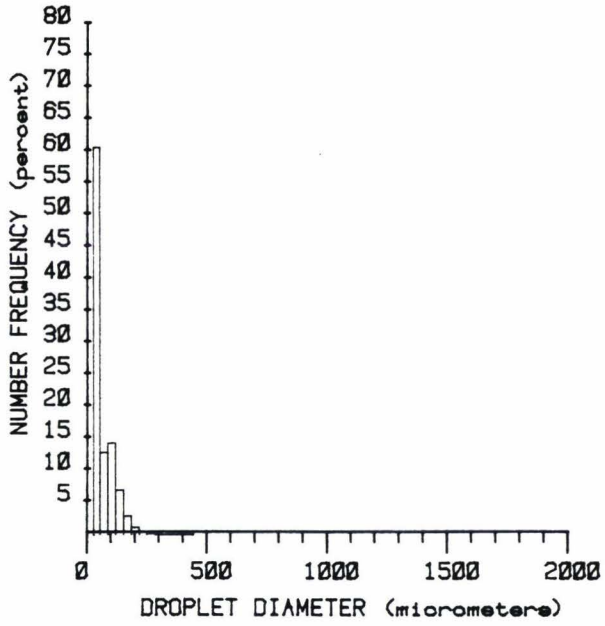
$D_{N0.9}$... 129.45 MICROMETERS $D_{V0.9}$... 232.03 MICROMETERS

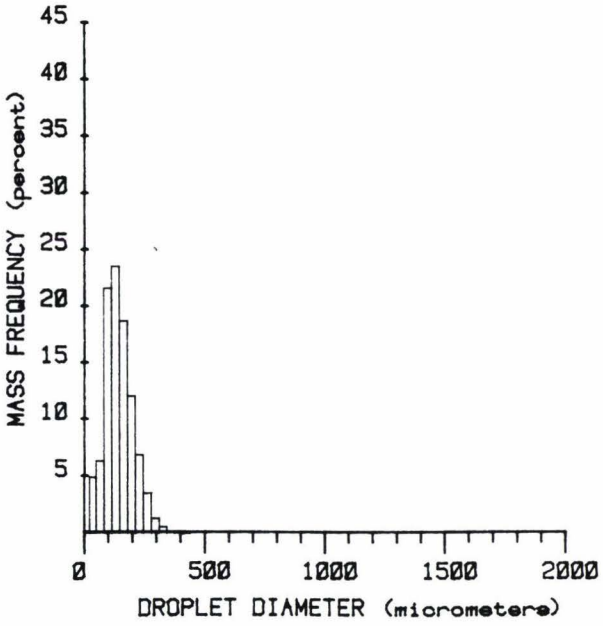
FIGURE I

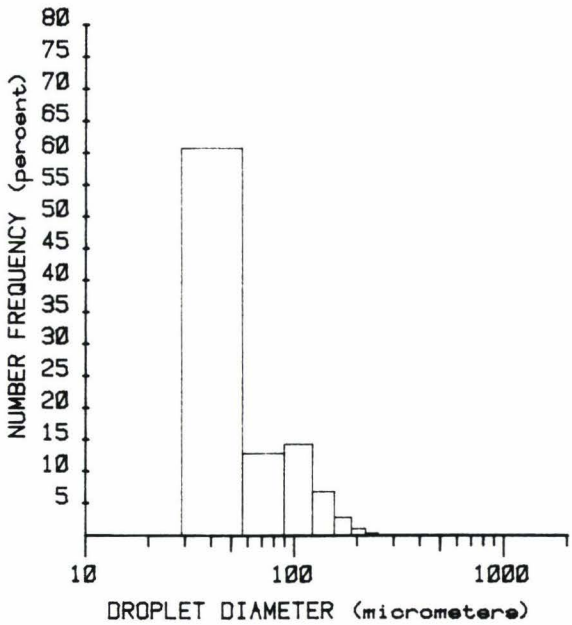
Nozzle Type..... *BEECOMIST 360A*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *15 PSI*
Airspeed..... *70 MPH*

Distance to Probe... *25 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *3.0 MHz*
Date..... *85/03/12*
Time..... *11:09:00*
File Number..... *11.1.11*









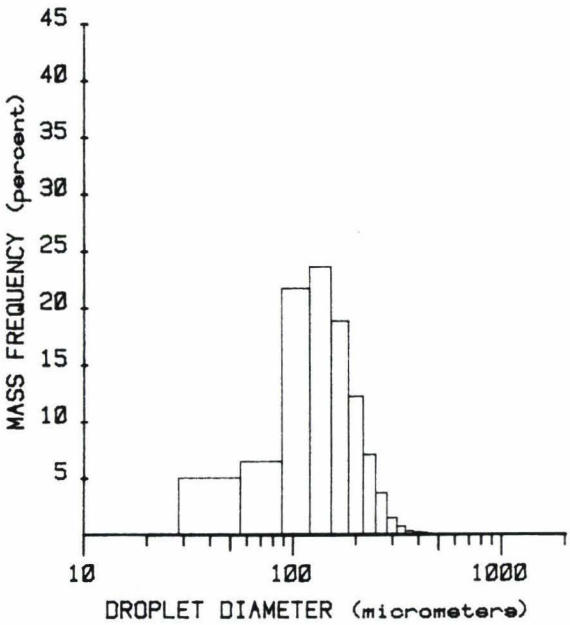


TABLE VII

SEDCOMIST 360A,70 MPH,.33 GPM,1 PART DIESEL 3L,1 PART WATER

DTG 85/04/30 11:45:00

DFM=1.0--3.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	gm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	6905	2.29E 08	7.53	67.80	8.72	67.80	8.72
89	8289	4.67E 07	9.27	13.81	10.73	81.61	19.45
122	8539	3.92E 07	23.79	11.60	27.54	93.21	46.99
154	7169	1.59E 07	21.77	4.71	25.20	97.92	72.19
187	5240	4.73E 06	12.26	1.40	14.19	99.32	86.38
219	3910	1.73E 06	7.56	0.51	8.75	99.83	95.13
252	2076	466451	3.18	0.14	3.68	99.97	98.81
284	617	82643	0.83	0.02	0.96	100.00	99.77
318	119	12204	0.18	0.00	0.20	100.00	99.97
351	10	1129	0.02	0.00	0.03	100.00	100.00
382	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		3.38E 08	86.39				

TOTAL RAW PARTICLES.... 42874/53741-- 79.78%

NUMBER MEAN DIAMETER... 59.48 MICROMETERS S.D.... 33.92

VOLUME MEAN DIAMETER... 78.78 MICROMETERS S.D.... 104.74

SAUTER MEAN DIAMETER... 104.31 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 60.21 MICROMETERS

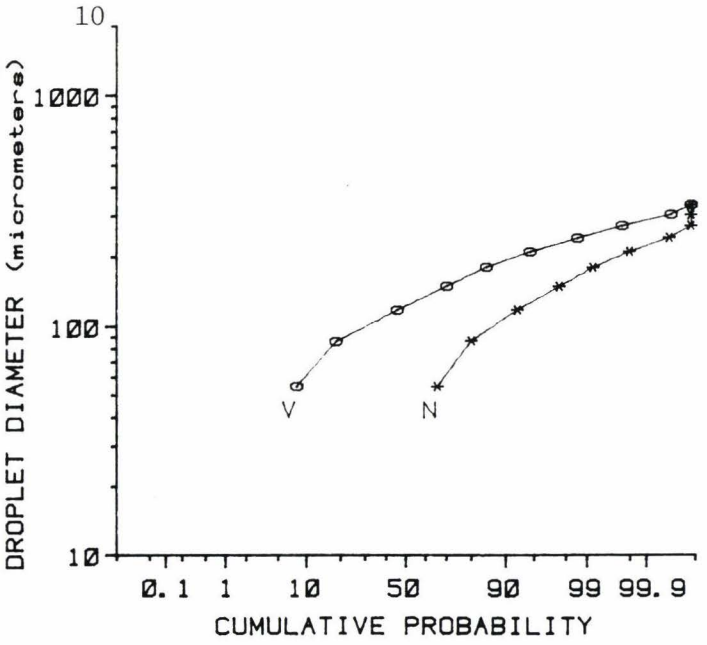
$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 125.55 MICROMETERS R.S.... 1.12

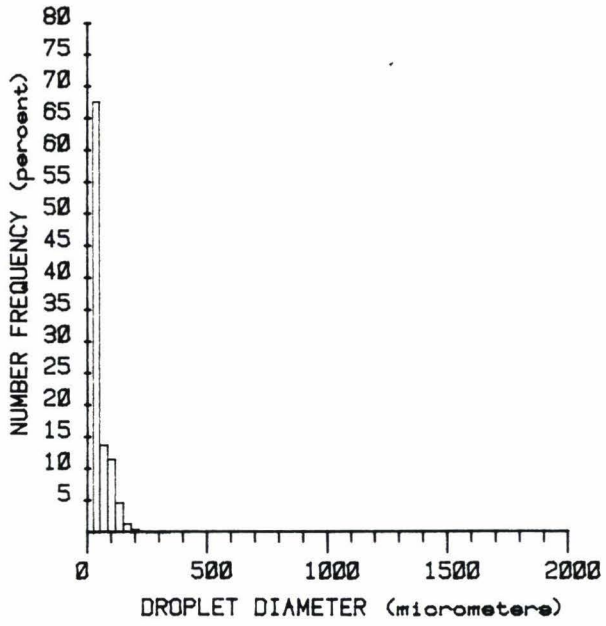
$D_{N0.9}$... 112.81 MICROMETERS $D_{V0.9}$... 200.60 MICROMETERS

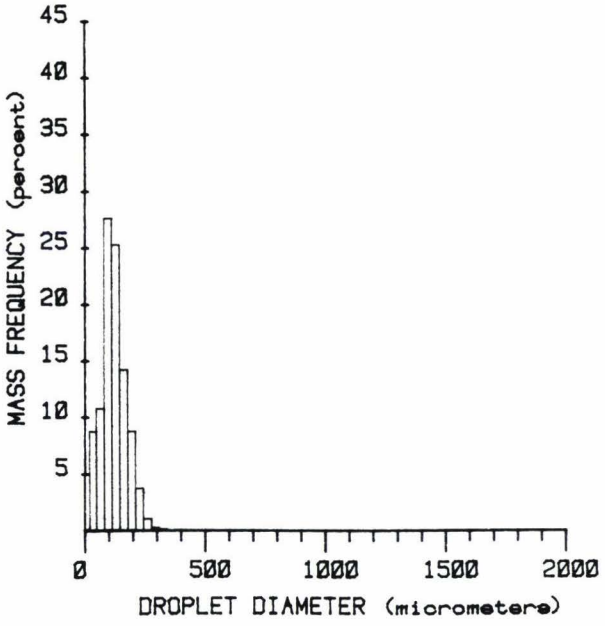
FIGURE II

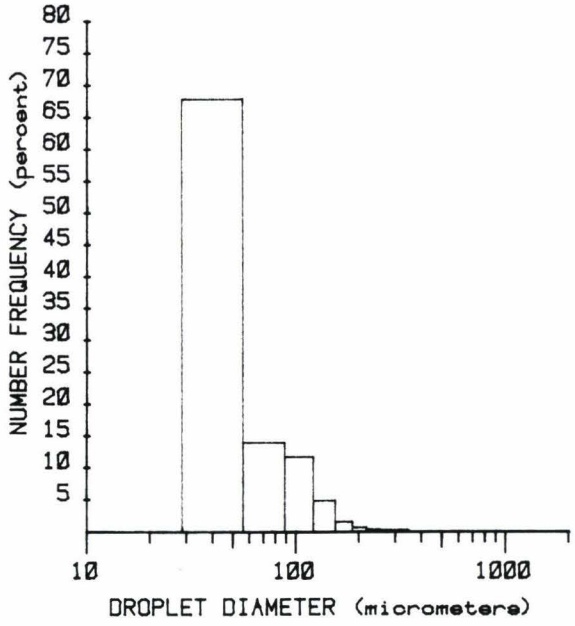
Nozzle Type..... *BEECOMIST 360A*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *30 PSI*
Airspeed..... *70 MPH*

Distance to Probe... *25 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *3.0 MHz*
Date..... *85/04/30*
Time..... *11:45:00*
File Number..... *11.1.14*









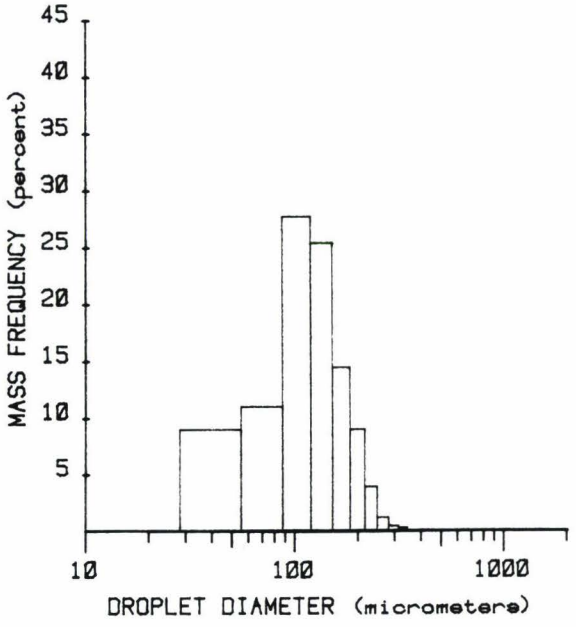


TABLE VIII

UNIMIZER,145 MPH,1.8 GPM,8500 RPM,DIPEL 8L,UNDILUTED

DTG 85/05/20 03:16:00

DFM=1.0--4.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	gm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	3442	6.72E 07	2.21	53.52	5.95	53.52	5.95
89	13481	3.13E 07	6.21	24.89	16.73	78.41	22.69
122	10023	1.72E 07	10.43	13.68	28.09	92.08	50.78
154	4265	7.21E 06	9.87	5.74	26.58	97.83	77.36
187	1279	2.22E 06	5.74	1.77	15.47	99.59	92.83
219	211	412347	1.80	0.33	4.86	99.92	97.68
252	37	67117	0.46	0.05	1.23	99.97	98.91
284	9	21719	0.22	0.02	0.59	99.99	99.50
318	2	6225	0.09	0.00	0.24	100.00	99.74
351	2	4894	0.10	0.00	0.26	100.00	100.00
382	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		1.26E 08	37.13				

TOTAL RAW PARTICLES.... 32751/44426-- 73.72%

NUMBER MEAN DIAMETER... 65.47 MICROMETERS S.D.... 34.14

VOLUME MEAN DIAMETER... 82.68 MICROMETERS S.D.... 103.15

SAUTER MEAN DIAMETER... 103.67 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 64.24 MICROMETERS

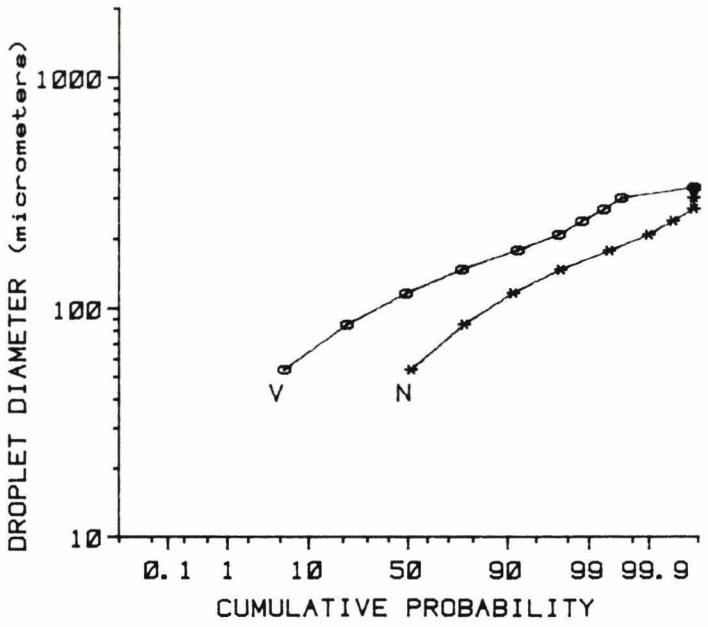
$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 121.02 MICROMETERS R.S.... 0.97

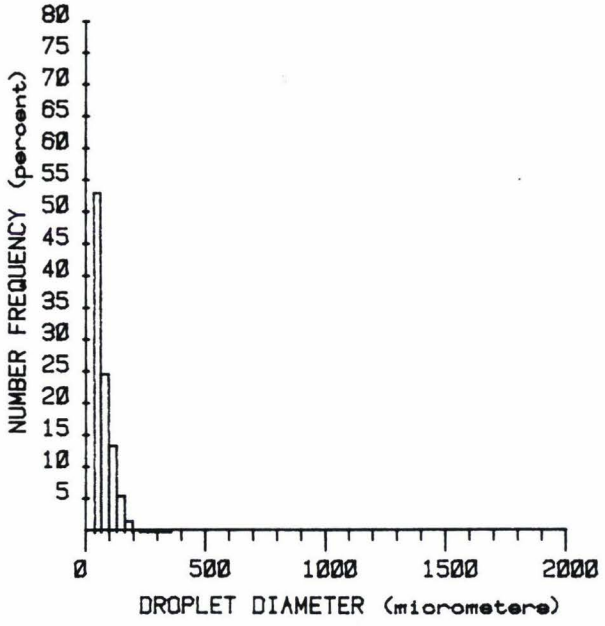
$D_{N0.9}$... 116.91 MICROMETERS $D_{V0.9}$... 181.25 MICROMETERS

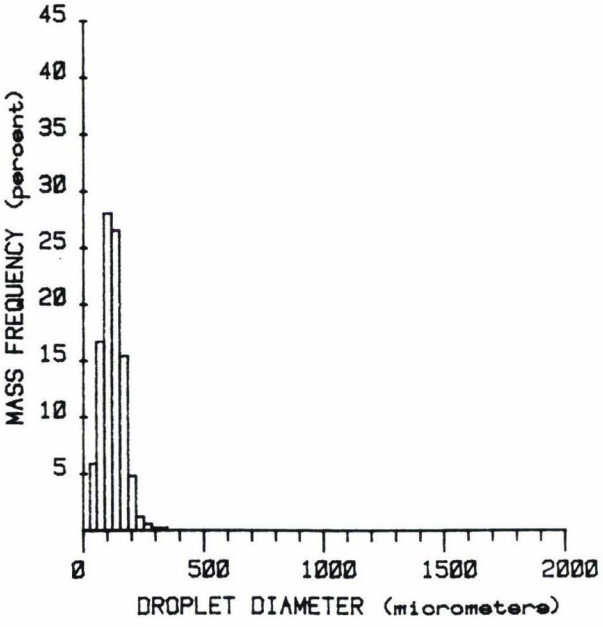
FIGURE III

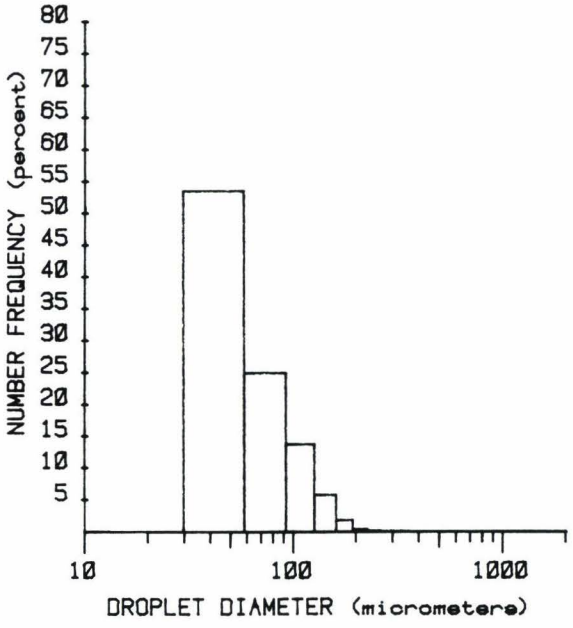
Nozzle Type..... *UNIMIZER*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *38 PSI*
Airspeed..... *145 MPH*

Distance to Probe... *30 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *4.0 MHz*
Date..... *85/05/20*
Time..... *03:16:00*
File Number..... *11.1.18*









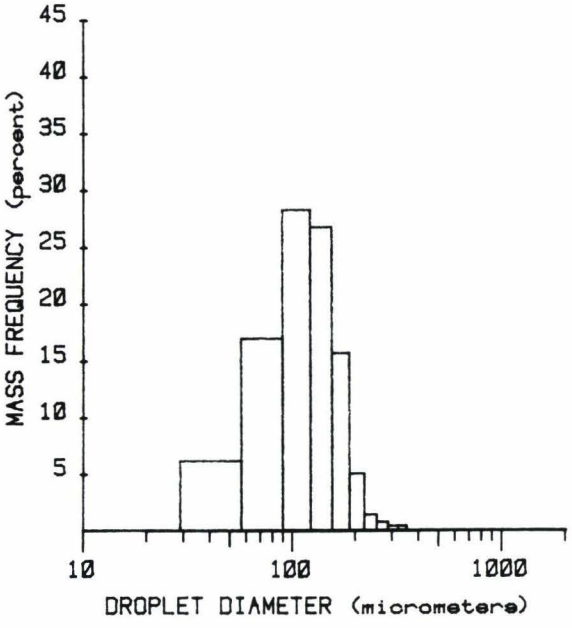


TABLE IX

AU5000,150 MPH,5.7 GPM,3 PARTS THURICIDE 32LV,1 PART WATER

DTG 85/05/07 00:31:00

DFM=1.0--4.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	gm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	1199	2.51E 08	8.25	53.70	4.76	53.70	4.76
89	3834	9.15E 07	18.19	19.59	10.48	73.29	15.24
122	5262	6.83E 07	41.46	14.61	23.89	87.91	39.13
154	4896	4.08E 07	55.81	8.73	32.16	96.64	71.29
187	2041	1.23E 07	31.93	2.64	18.40	99.28	89.69
219	543	2.53E 06	11.07	0.54	6.38	99.82	96.07
252	154	641426	4.37	0.14	2.52	99.96	98.59
284	42	129751	1.30	0.03	0.75	99.98	99.34
318	12	65787	0.95	0.01	0.54	100.00	99.89
351	2	10139	0.20	0.00	0.11	100.00	100.00
382	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		4.67E 08	173.53				

TOTAL RAW PARTICLES.... 17985/30602-- 58.77%

NUMBER MEAN DIAMETER... 68.98 MICROMETERS S.D.... 38.62

VOLUME MEAN DIAMETER... 89.22 MICROMETERS S.D.... 110.48

SAUTER MEAN DIAMETER... 113.62 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 72.77 MICROMETERS

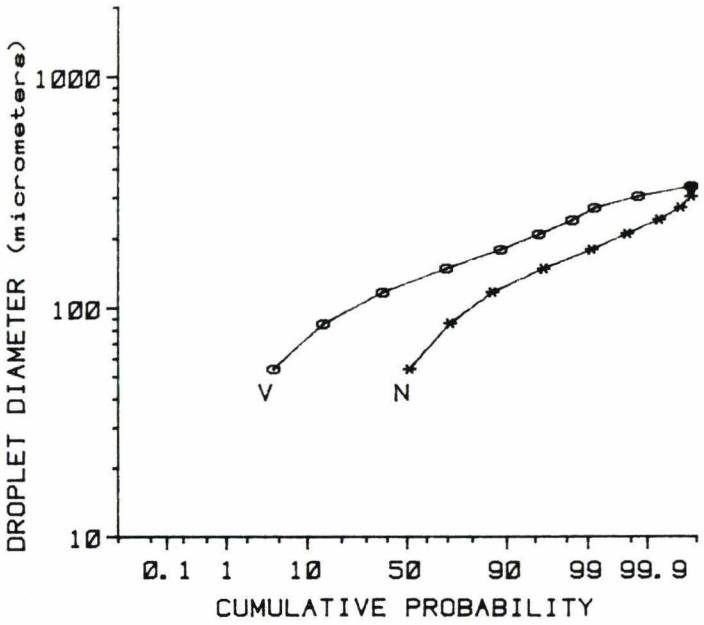
$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 132.76 MICROMETERS R.S.... 0.87

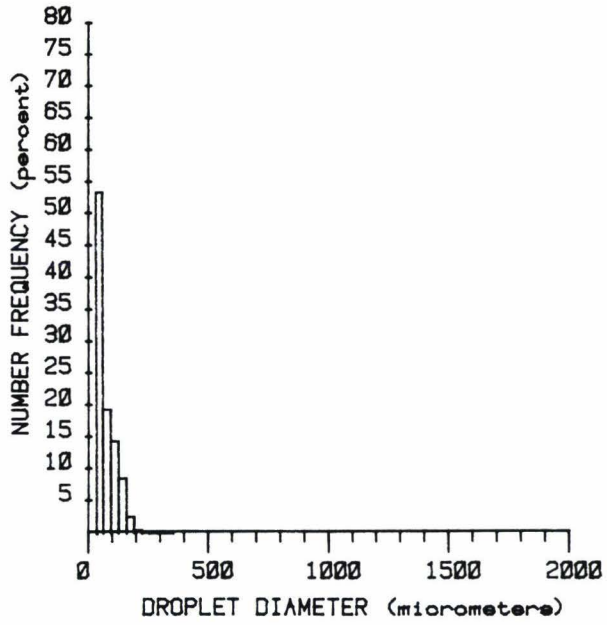
$D_{N0.9}$... 129.52 MICROMETERS $D_{V0.9}$... 188.53 MICROMETERS

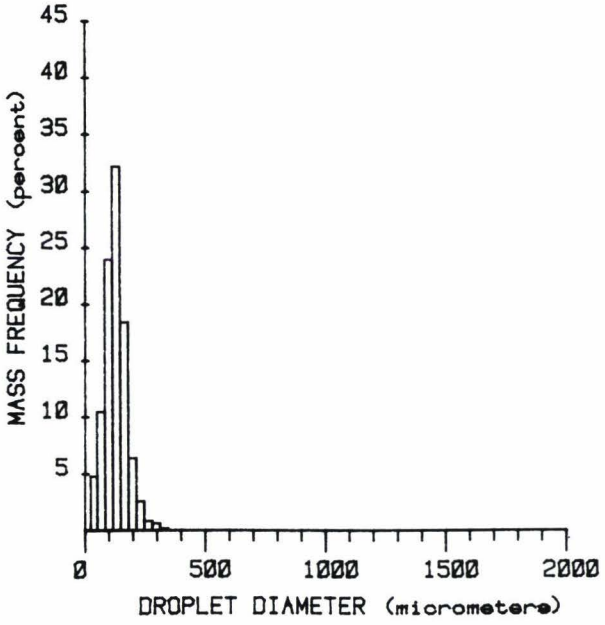
FIGURE IV

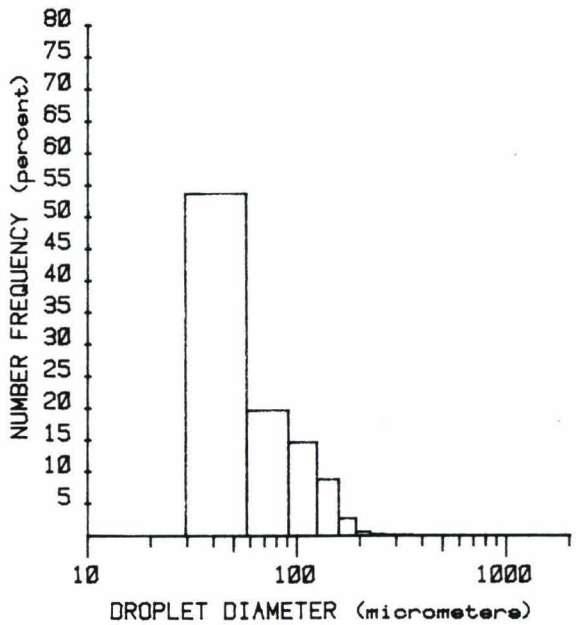
Nozzle Type..... *AU5000*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *50 PSI*
Airspeed..... *150 MPH*

Distance to Probe... *46 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *4.0 MHz*
Date..... *85/05/07*
Time..... *00:31:00*
File Number..... *11.1.15*









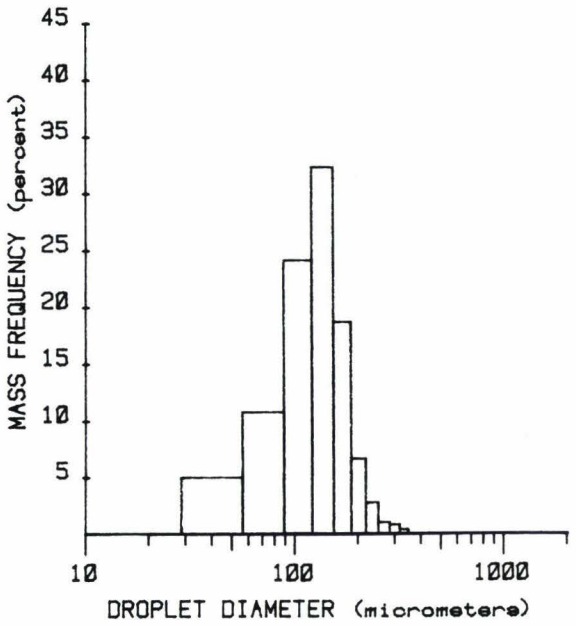


TABLE X

AU5000,150 MPH,5.7 GPM.1 PART THURICIDE 48LV,1 PART WATER

DTG 85/05/08 12:24:00

DFM=1.0--4.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	qm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	1062	2.87E 08	9.42	56.19	4.91	56.19	4.91
89	3280	9.53E 07	18.94	18.68	9.87	74.88	14.79
122	4002	6.84E 07	41.54	13.41	21.66	88.29	36.44
154	3628	4.11E 07	56.20	8.06	29.30	96.35	65.74
187	1316	1.31E 07	33.99	2.57	17.72	98.92	83.46
219	343	3.82E 06	16.70	0.75	8.71	99.67	92.17
252	78	1.00E 06	6.83	0.20	3.56	99.87	95.73
284	32	478807	4.81	0.09	2.51	99.96	98.24
318	4	157060	2.26	0.03	1.18	99.99	99.41
351	3	42500	0.83	0.01	0.43	100.00	99.85
382	0	0	0.00	0.00	0.00	100.00	99.85
414	1	8827	0.29	0.00	0.15	100.00	100.00
447	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		5.10E 08	191.80				

TOTAL RAW PARTICLES.... 13749/25311-- 54.32%

NUMBER MEAN DIAMETER... 67.82 MICROMETERS S.D.... 39.40

VOLUME MEAN DIAMETER... 89.59 MICROMETERS S.D.... 116.47

SAUTER MEAN DIAMETER... 116.89 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 73.27 MICROMETERS

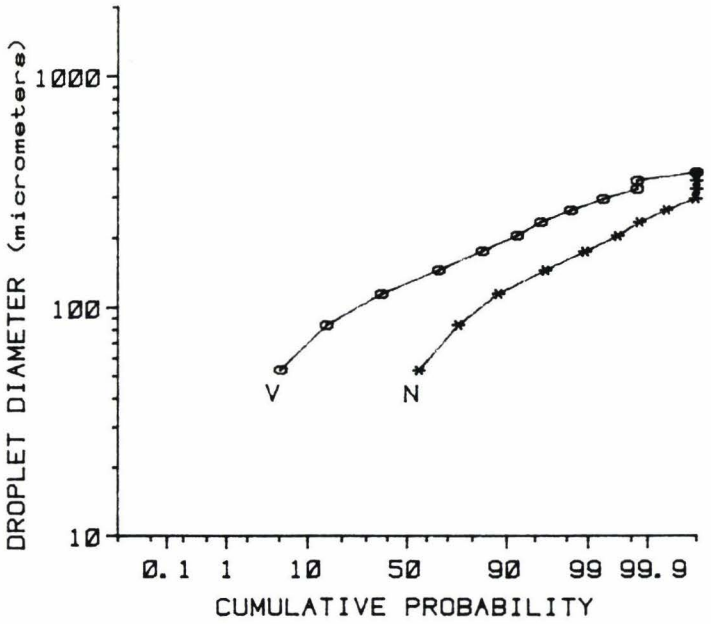
$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 136.87 MICROMETERS R.S.... 1.01

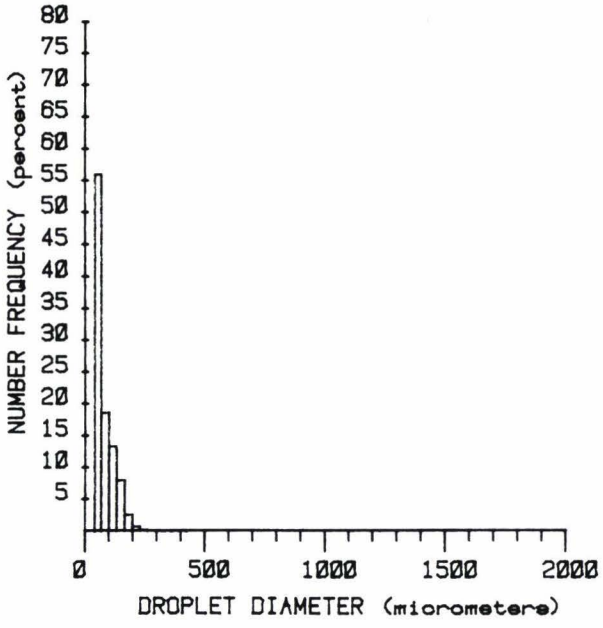
$D_{N0.9}$... 128.61 MICROMETERS $D_{V0.9}$... 211.72 MICROMETERS

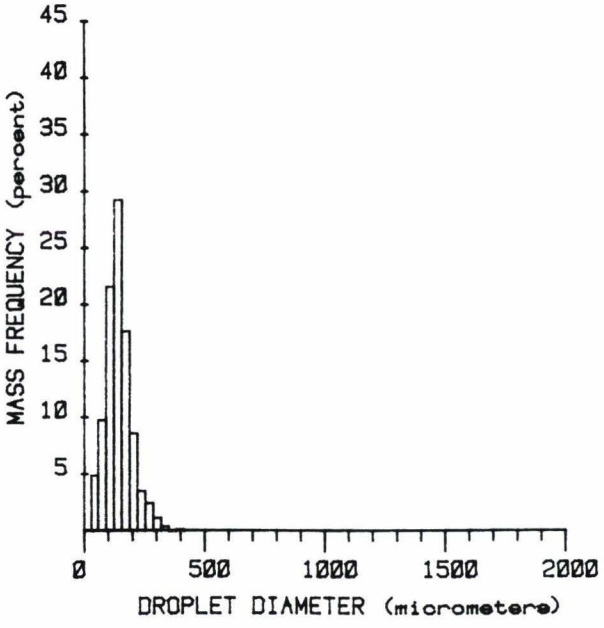
FIGURE V

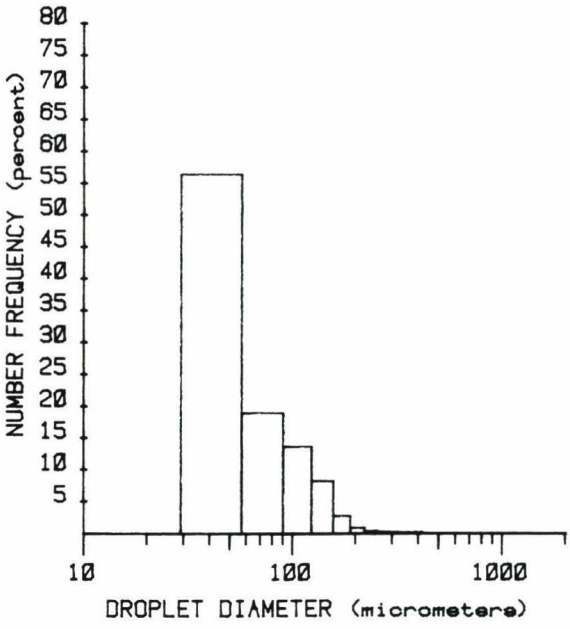
Nozzle Type..... *AU5000*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *50 PSI*
Airspeed..... *150 MPH*

Distance to Probe... *46 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *4.0 MHz*
Date..... *85/05/08*
Time..... *12:24:00*
File Number..... *11.1.16*









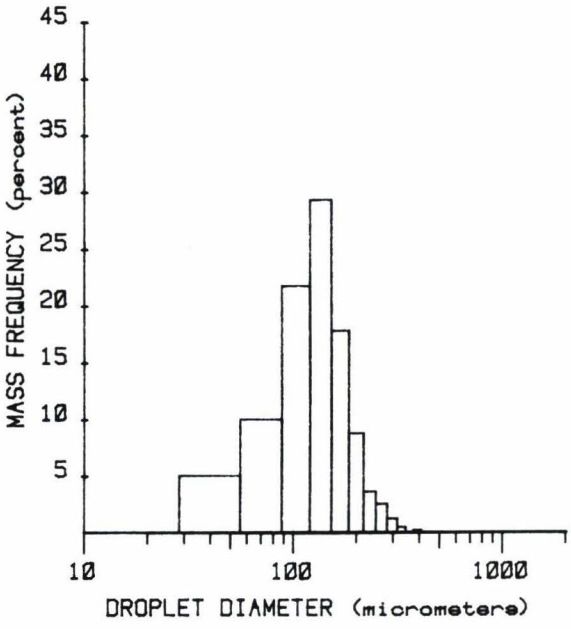


TABLE XI

AU5000,150 MPH,5.7 GPM,1 PART DIPEL 6L,1 PART WATER

DTG 85/05/08 14:24:00

DFM=1.0--4.0 MHz

UPPER LIMIT	N(RAW)	N/SEC	qm/SEC	% N	% VOL.	ACCUMULATED % N	ACCUMULATED % VOL.
56	1026	2.74E 08	9.01	52.74	4.24	52.74	4.24
89	3384	1.01E 08	20.03	19.40	9.42	72.14	13.65
122	4020	7.23E 07	43.90	13.92	20.64	86.06	34.30
154	4218	4.88E 07	66.79	9.40	31.41	95.46	65.70
187	2726	1.86E 07	48.10	3.58	22.62	99.04	88.32
219	917	4.21E 06	18.39	0.81	8.65	99.85	96.97
252	179	578356	3.94	0.11	1.85	99.96	98.83
284	39	172230	1.73	0.03	0.81	99.99	99.64
318	8	50773	0.73	0.01	0.34	100.00	99.98
351	1	701	0.01	0.00	0.01	100.00	99.99
382	0	0	0.00	0.00	0.00	100.00	99.99
414	1	729	0.02	0.00	0.01	100.00	100.00
447	0	0	0.00	0.00	0.00	100.00	100.00
TOTALS		5.19E 08	212.66				

TOTAL RAW PARTICLES.... 16519/25269-- 65.37%

NUMBER MEAN DIAMETER... 70.73 MICROMETERS S.D.... 40.49

VOLUME MEAN DIAMETER... 92.16 MICROMETERS S.D.... 113.01

SAUTER MEAN DIAMETER... 117.88 MICROMETERS

$D_{N0.1}$... 0.00 MICROMETERS $D_{V0.1}$... 76.46 MICROMETERS

$D_{N0.5}$... 0.00 MICROMETERS $D_{V0.5}$... 138.11 MICROMETERS R.S.... 0.85

$D_{N0.9}$... 135.44 MICROMETERS $D_{V0.9}$... 193.34 MICROMETERS

FIGURE VI

Nozzle Type..... *AU5000*
Nozzle Angle Rel.
to Airstream..... *0°*
Spray Pressure..... *50 PSI*
Airspeed..... *150 MPH*

Distance to Probe... *46 cm.*
Depth of Field..... *1.0 cm.*
Slice Rate..... *4.0 MHz*
Date..... *85/05/08*
Time..... *14:24:00*
File Number..... *11.1.17*